# EXHIBIT H

MECANICA SCIENTIFIC SERVICES

# Supplemental Report

Prepared by
Wesley Grimes

RE:
## Bryson v. Rough Country, LLC
Mecanica Case Number: 22-3104
Date of Collision: March 15, 2020

Location of Crash:
Intersection of Georgia 2 and Georgia 5
Blue Ridge, Fannin County, Georgia

*Report Prepared For:*

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Report Date: November 26, 2024

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## List of Qualifications

The analysis, as described in this report, has been completed by Wesley D. Grimes, P.E. and includes some work by personnel at Mecanica Scientific Services under his direction. Below is a summary of qualifications. Appendix A, in the original report has full details.

- Bachelor of Science degree from Arizona State University
- Licensed professional engineer in Arizona
- Involved in the field of accident reconstruction for over 40 years
- Very active in this scientific community as a session co-organizer for Society of Automotive Engineering (SAE) World Congress for sessions involving accident reconstructions for 10 years, including topics such as: crash modeling, vehicle dynamics, crush energy calculations, roll overs, heavy-truck crash analysis, computer modeling of motor vehicle crashes, photogrammetry, etc.
- Taught courses in accident reconstruction for over 20 years, including advanced classes.
- Published more than 30 treatises in this field
- Qualified to testify in federal and state courts, including (but not limited to): Arizona, Alabama, Florida, Texas, Oregon, New Mexico, Illinois, Pennsylvania, Ohio, Indiana, Michigan, Minnesota
- Attended many courses for continuing education in this field, including (but not limited to): 3-d modeling, photogrammetry, low-speed crashes, heavy-truck crash analysis, air bag systems, side impacts, CDR training, ECM download training, etc.
- Member of several organizations relating to accident reconstruction and analysis, such as: SAE, Committee On Accident Investigation and Reconstruction Practices (1984-2011), NAPARS (National Association of Professional Accident Reconstructionists)

## Items Obtained and Reviewed after March 27, 2024

- Paul Lewis deposition, March 18, 2024
- Christopher Roche deposition, July 17, 2024
- Bryant Buchner amended report, May 8, 2024
- Bryant Buchner deposition, July 11, 2024
- Bryant Buchner HVE case file, dated June 19, 2024
- Defense supplement to initial disclosures
- Lisa Gwin report, March 29, 2024
- Charles Crosby report, March 29, 2024
- Paul Lewis supplemental report, March 15, 2024
- Bryant Buchner rebuttal report, June 14, 2024
- 2nd Supplement to Plaintiff's initial disclosures
- Christopher Roche supplemental report, June 14, 2024

## General Event Summary

On March 15, 2020, a two-vehicle collision occurred at the intersection of Georgia State Route 2 and Georgia State Route 5 in Fannin County, Georgia. At approximately 11:15 p.m., the front of a 2016 Ford F-250 pickup, driven by Mr. Hunter Elliott, impacted the rear of a 2008 Ford Escape, driven by Ms. Santana Kelley. Mr. Elliott was driving westbound on Georgia 2 when the collision occurred. Ms. Kelley was stopped at the red traffic signal in the left westbound lane on Georgia 2 at the intersection with Georgia 5. Mr. Joshua Bryson was a passenger in the right-front seat of the Escape. Mr. Cohen Bryson was also a passenger in the Escape, seated in a forward-facing car seat behind the driver's seat.

## Further Analysis

Bryant Buchner of Quest Engineering (QE) and Christopher Roche of Robson Forensics (Robson) both authored rebuttal or amended reports dated June 14, 2024. This report contains a basic summary of the analyses conducted by QE and Robson Forensic and their respective depositions.

*HVE (Human Vehicle Environment) Software*

Mr. Buchner, in his October 12, 2023 report, offered the opinion that the crush on the Escape would be significantly reduced had the Ford F-250 not had a lift kit installed, see **Figure 41**. In his deposition, dated January 23, 2024, Mr. Buchner indicated that this is based upon his HVE simulations, see **Figure 42**.

- Had the stock F250 impacted the rear of the Escape at 51 mph and contacted the Escape's bumper and related structural components more directly, reasonably the crush on the rear of the Escape would have been dramatically reduced by near 1/2 or over 2 feet.

***Figure 41: Bullet point from page 11 of Mr. Buchner's October 12, 2023 report.***

5 HVE was just a tool to analyze what
6 should have happened without a lifted truck.
7 That's all it was.

***Figure 42: Lines 5-7, page 38 of Mr. Buchner's January 23, 2024 deposition.***

Mr. Buchner failed to produce his HVE case file prior to his deposition in January 2024. He apparently did not preserve the computer file and thus only produced some printouts that had been saved. MSSC attempted to reproduce Mr. Buchner's HVE materials using his printouts, but we were unable to verify his HVE runs. Later, Mr. Buchner produced a separate 'new' HVE case file, dated June 19, 2024, and this is the file we utilized in our analysis of his HVE work.

The SIMON (SImulation MOdel Non-linear) run in the June 19, 2024 case file was apparently executed and saved utilizing HVE Version 17.00. Note that the current version of HVE is Version 18.02. We installed the older version of HVE to duplicate Mr. Buchner's work in this case. After running the simulations under Version 17.00, the case file was saved and opened in the current version to print the various images, as the new version has better image layout for damage data.

Utilizing that HVE case file as our base file, the following changes were made to explore the opinions expressed by Mr. Buchner concerning his usage of the HVE software in this case:

1. The SIMON event was copied and re-executed to ensure duplication of Mr. Buchner's simulation results.
    a. The damage pattern was captured using Damage Studio in HVE (**Figure 43**).

2. The Ford F-250 vehicle was copied and the wheels moved approximately 6 inches downward to model a lift kit on the vehicle.
    a. This 'lifted' HVE vehicle was then utilized in another copy of Mr. Buchner's base SIMON run.
    b. The damage pattern was captured using Damage Studio in HVE (**Figure 44**).

3. Simulation of the crash test was completed with a 15 inch offset.
    a. The weights of the two vehicles were changed to approximately match the weights of the test vehicles in the crash test conducted at Exponent on May 15, 2023.
    b. The 'test' vehicles were substituted into a copy of the base simulation run.
    c. The lateral position was changed to -15 inches.
    d. The damage pattern was captured using the Damage Studio in HVE (**Figure 45**).

4. Simulation of the crash test was completed with a 18 inch offset.
    a. The 'test' vehicles were substituted into a copy of the base simulation run.
    b. The lateral position was changed to -18 inches.
    c. The damage pattern was captured using the Damage Studio in HVE (**Figure 46**).

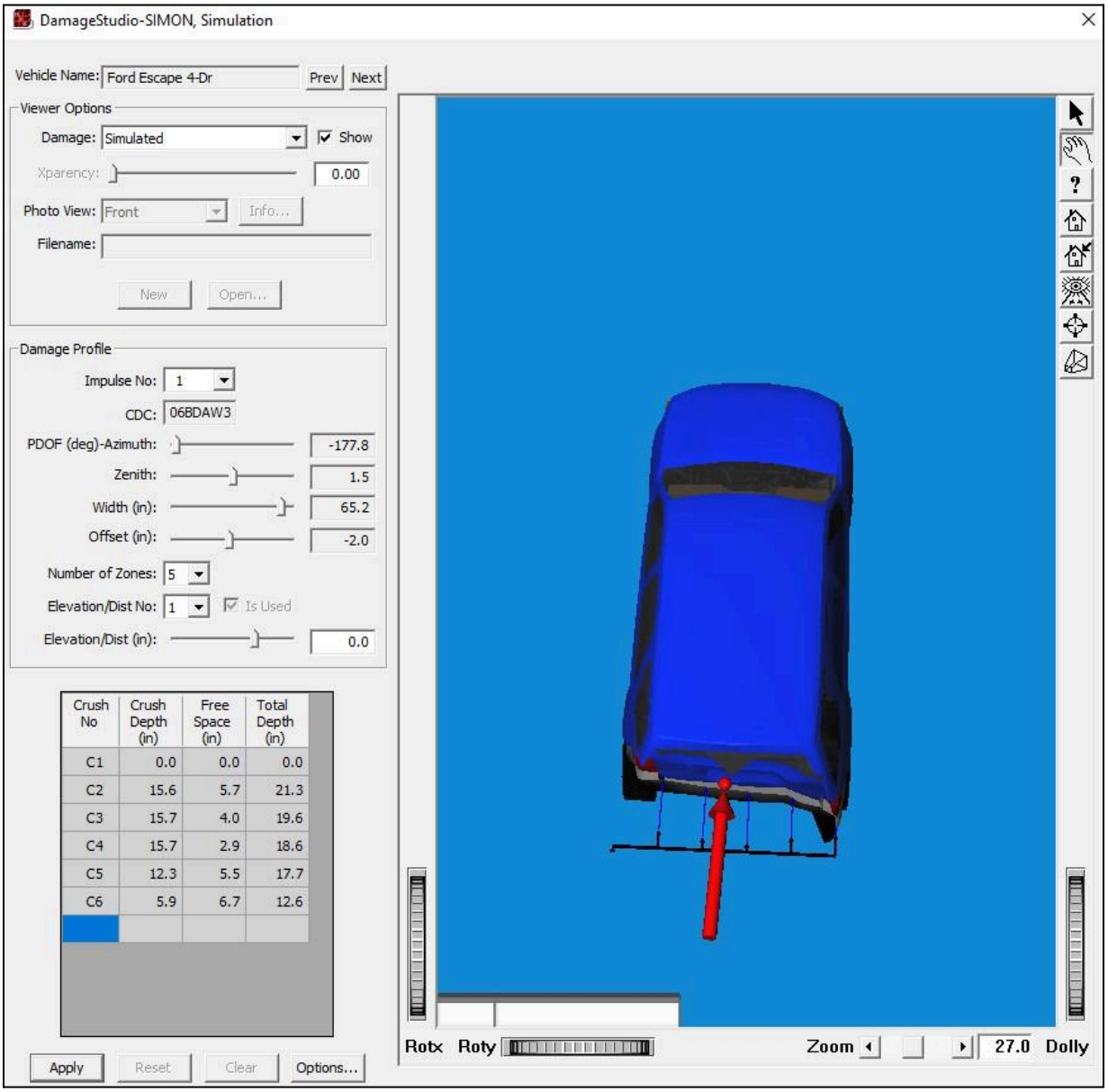



***Figure 43: HVE damage data for Ford Escape from base simulation run.***

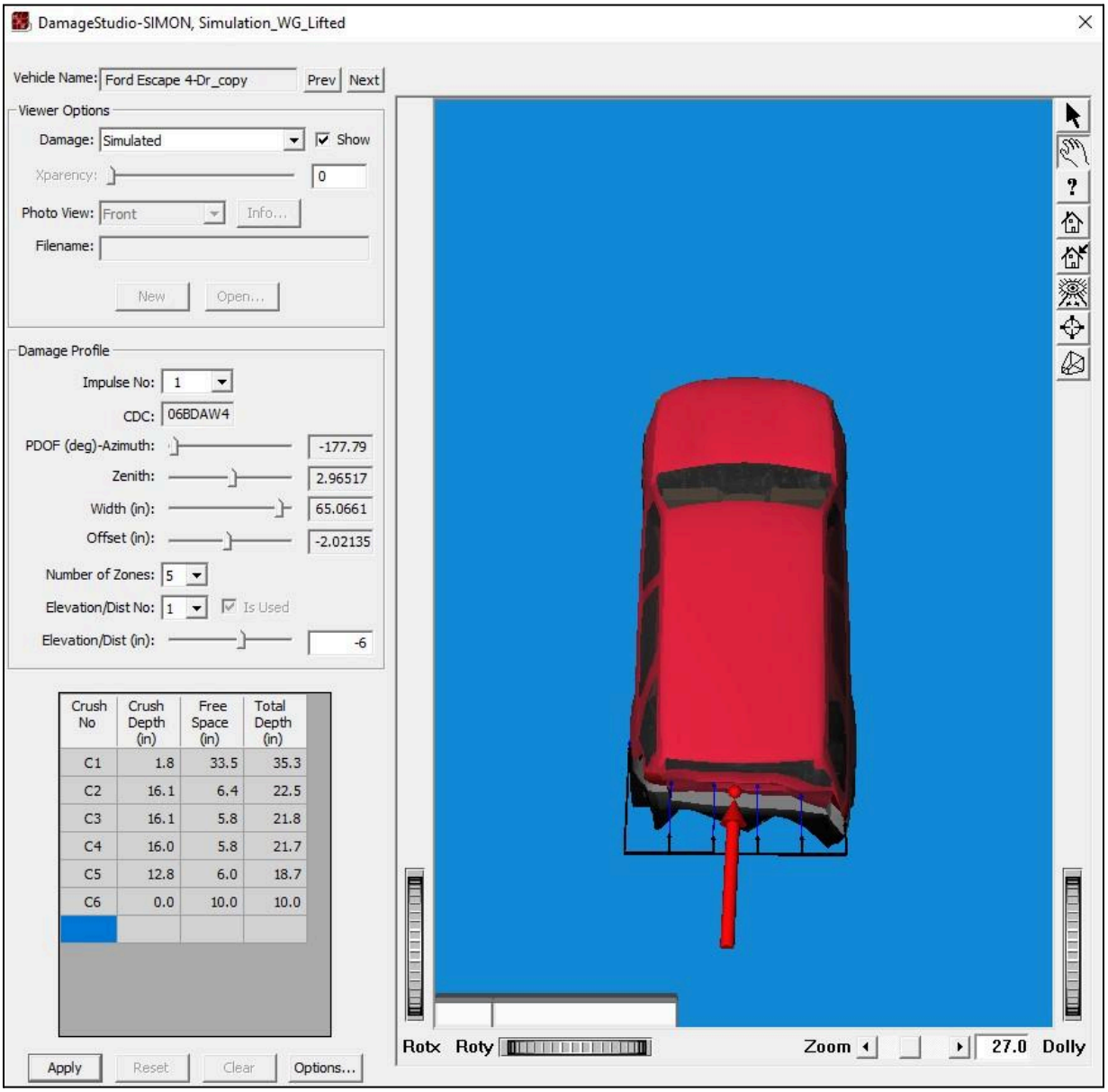



***Figure 44: HVE damage data for Ford Escape in simulation run with lifted F-250.***

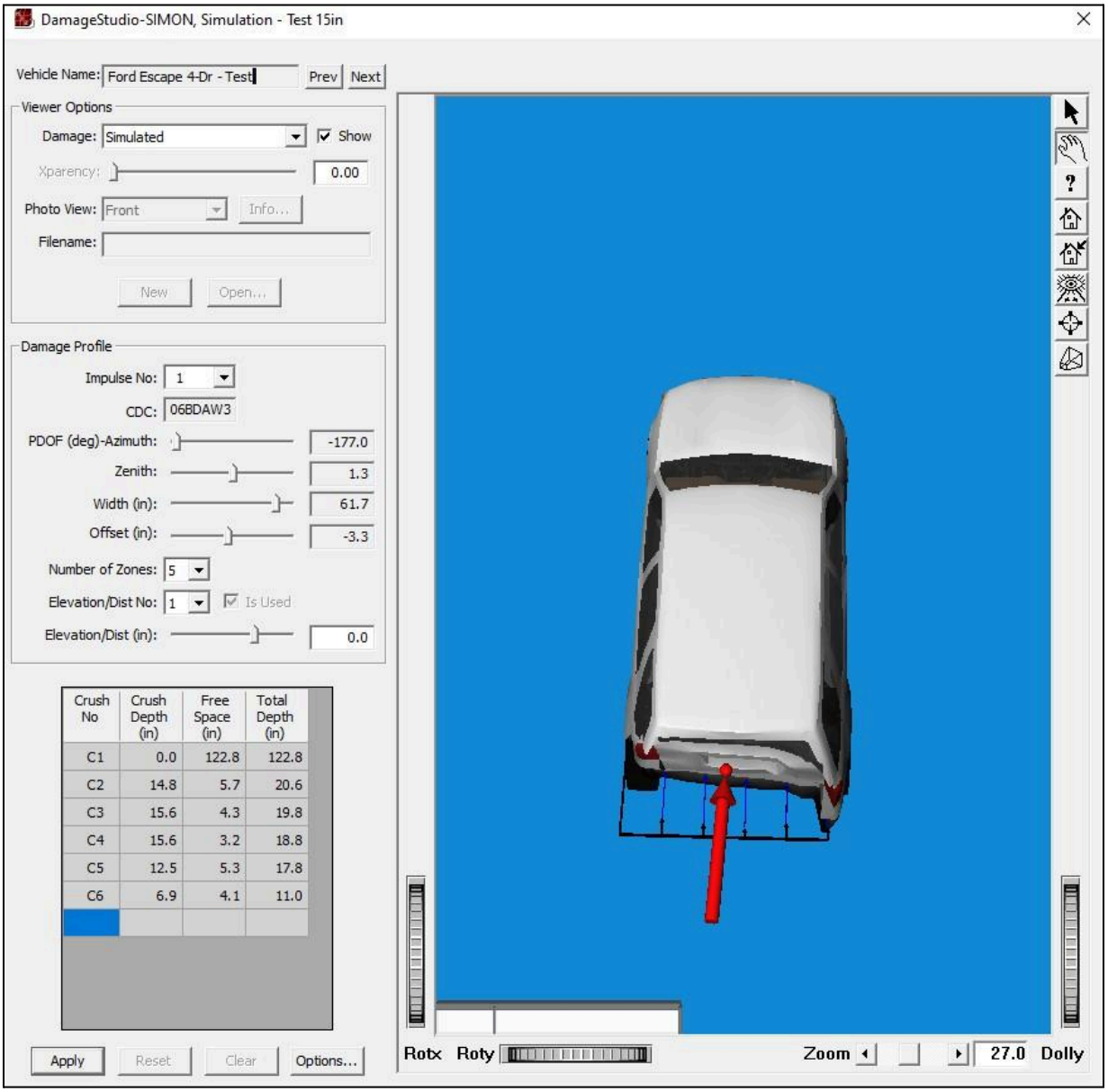



***Figure 45: HVE damage data for Ford Escape in simulation run with 15 inch offset.***

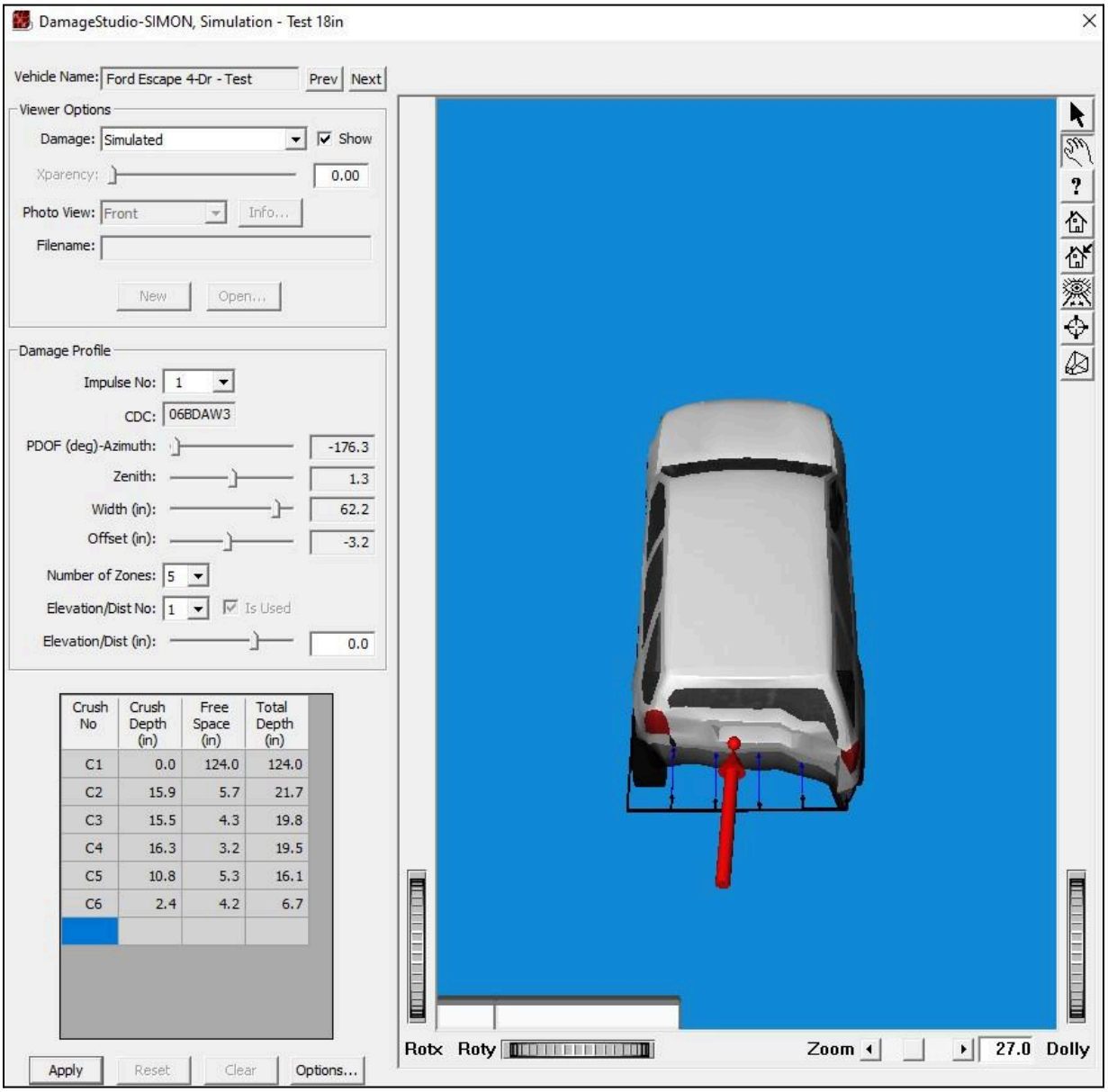



***Figure 46: HVE damage data for Ford Escape in simulation run with 18 inch offset.***

**Table 2** is a summary of the crush profiles from these various HVE SIMON simulation runs. As expected, the crush depths vary a little between the different impact configurations, but overall are very consistent, even though the impact configurations were significantly different. These results show that the SIMON tool is not accurately modeling the crush on the Ford Escape in this case, at these speeds and impact configurations. The SIMON model is very capable of simulating the crash, but it has not been validated for accurately predicting vehicle crush or occupant compartment intrusion. In general, the stiffness values for the vehicles would need to be adjusted, based on crash testing, in order to produce crush profiles that are a closer match to the actual vehicles involved in the subject crash and the crash test. In summary, Mr. Buchner's usage of HVE to predict crush on the Ford Escape is not reliable.

**Table 2 - Summary of HVE crush profiles from SIMON simulation runs.**

| Simulation Config. | Elevation of Crush Data (inches) | C1 (inches) | C2 (inches) | C3 (inches) | C4 (inches) | C5 (inches) | C6 (inches) |
|---|---|---|---|---|---|---|---|
| Base Offset of 12 inches | 0 | 0.0 | 15.6 | 15.7 | 15.7 | 12.3 | 5.9 |
| Lifted 6 in. | -6 | 1.8 | 16.1 | 16.1 | 16.0 | 12.8 | 0.0 |
| Offset 15 in. | 0 | 0.0 | 14.8 | 15.6 | 15.6 | 12.5 | 6.9 |
| Offset 18 in. | 0 | 0.0 | 15.9 | 15.5 | 16.3 | 10.8 | 2.4 |

*Crash Test Alignment*

Mr. Buchner on page 8 and page 9 of his June 14, 2024, report used a frame from the crash test overhead video (QE Figure 6) to measure the difference between the longitudinal centerlines or offset of the crash test vehicles (**Figure 47**). As can be seen in the QE Figure 6, the overhead camera was not centered over the crash rail, but more centered over the Escape. Furthermore, the still frame used in the QE report was not at impact. T0 (time zero) lights were placed on the F-250. These lights illuminate when the vehicle first contact, indicating impact, and were not illuminated in Figure 6 of the QE report.


***Figure 6**: Scaled image from crash test video with the total offset measurements*

***Figure 47: Figure 6 from QE report dated 6/14/24. Camera not centered over crash rail. (Still frame rotated 180 degrees.)***

Mecanica performed the test setup again with exemplar vehicles on June 25, 2024, at Exponent with the overhead camera in a similar position to the crash test (**Figure 48 and Figure 49**). With the overhead camera in a similar position, it can be seen that even though the F250's longitudinal centerline is over the center of the crash rail, it appears that it is to the left of the rail three inches or more (**Figure 50**). This is due to the parallax of the camera. This can also be observed at the bottom of the overhead camera photograph where the concrete edge appears curved.

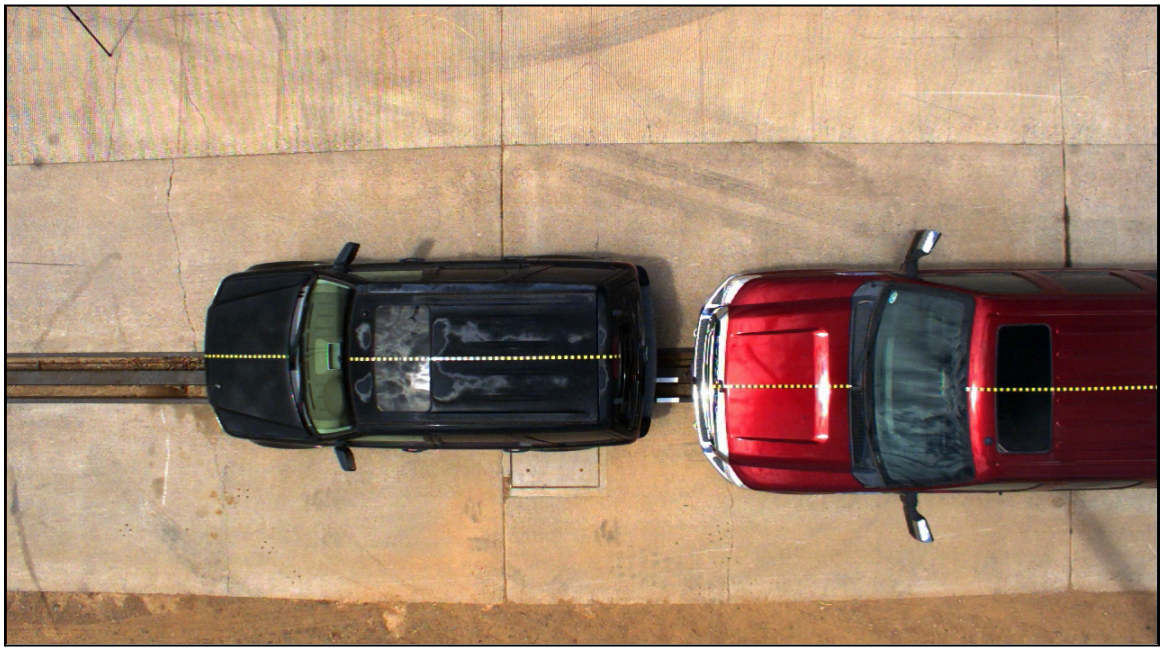


***Figure 48: Overhead video camera view with the exemplar F-250 centerline over the crash rail centerline.***

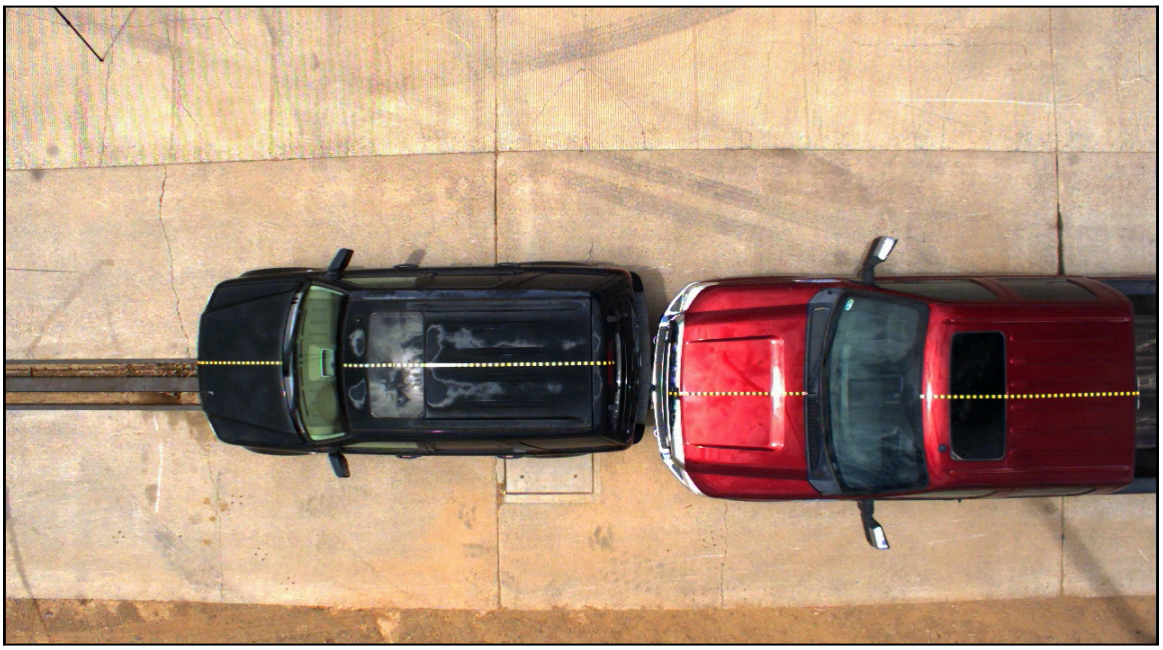


***Figure 49: Overhead video camera view with the exemplar F-250 centerline over the crash rail centerline at contact.***

***Figure 50: Vehicles in the same position as Figure Z above.***

As seen from the overhead video camera from the crash test, the inch tape on the F-250 hood is aligned approximately one-half to one inch inside the left rear-window hinge of the Escape (**Figure 51**). The illuminated T0 lights on the dash and left A-pillar show this frame was at time

zero (T0) or impact. Since these two locations are relatively close in height, camera parallax is decreased. The distance between the Escape rear-window hinges was approximately 26.5 inches (**Figure 52**), so the distance between the inside of the left hinge and the Escape's longitudinal centerline was 13.25 inches. Removing one inch to one-and-one-half inches from that distance indicates the F-250's longitudinal centerline was approximately 11.75 inches to 12.25 inches to the left of the Escape's longitudinal centerline.

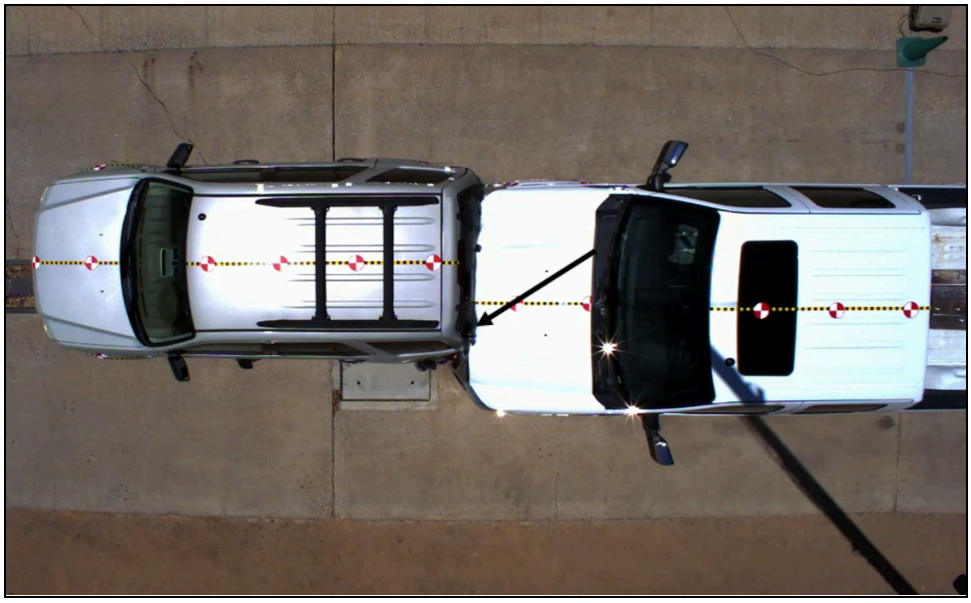


***Figure 51: Test vehicles at impact showing alignment between F-250 centerline and Escape's left rear-window hinge.***

***Figure 52: Distance between the rear window hinges.***

Exemplar vehicles were also lined up to replicate the crash test alignment. The Escape was first aligned on the crash rail. Measurements were taken from the longitudinal centerline of the Escape 10.9 inches to the left on the front and rear bumpers. These points were then aligned with the crash rail centerline (**Figures 53 and Figure 54**). The front of the F-250 was then moved to the rear of the Escape, with the F-250's longitudinal centerline aligned with the crash rail centerline (**Figure 55**). In this configuration, the F-250's longitudinal centerline was just inside the left rear-window hinge (**Figure 56**).

***Figure 53: Front of an exemplar Escape with the crash rail centerline 10.9 inches left of Escape's longitudinal centerline.***

***Figure 54: Rear of an exemplar Escape with the crash rail centerline 10.9 inches left of Escape's longitudinal centerline.***

***Figure 55: Alignment of exemplar vehicles according to the crash test setup.***

***Figure 56: Alignment of F-250's centerline with the Escape's left rear-window hinge.***

The Ford logo at the front of the F-250 was approximately 12 inches wide, from one outer edge of the blue border to the other, shown in **Figure 57**. The center of the logo was six inches from either outer edge of the blue border. In other words, the '6' on the inch tape is the approximate middle of the logo shown in **Figure 57**.

***Figure 57: Width of the Ford logo on the F-250***

There were impressions, or scuffs, from a Ford F-250 logo on the Ford Escape from the subject crash as well as the Ford Escape used in the crash test. There was a trim panel on each Ford Escape located in the middle of the hatchback at the glass line, and the lower-left corner of this panel was used as a reference point on each vehicle to identify where the logo scuff was located.

There is no way to determine exactly when this logo impression was created during the interaction between the vehicles. They were not created at the initial point of impact since the F-250's front bumper would first contact the Escape. Also, note that these are complex 3-dimensional surfaces and 2-dimensional photos cannot place these marks more accurately than approximately a ¼ (0.25) inch. **Figure 58** depicts photos from both vehicles and the progression of images including the following:

- The contrast was adjusted to increase the visibility of the logo scuffs.
- A mirror image of the exemplar Ford F-250 logo was overlaid.
- A mirror image of the Ford F-250 including inch tape was overlaid.

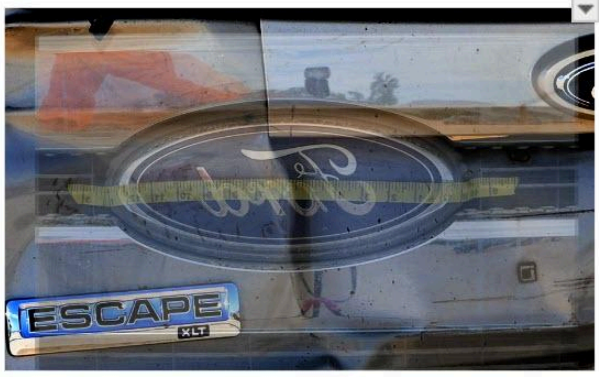
| F-250 Logo Scuff on Subject Ford Escape | F-250 Logo Scuff on Test Ford Escape |
|---|---|
|  |  |
|  |  |
|  |  |

***Figure 58: Image overlays depicting F-250 logo scuff on Ford Escape.***

**Figure 59** continues the progression of images from **Figure 58**, including the following:

- Red 'index' lines were placed on the images referencing the lower left corner of the trim panel.
- A close-up of the image with the red index lines.
- The mirror image of the Ford F-250 logo was removed, leaving the red index lines.


***Figure 59: Image overlays depicting F-250 logo scuff on Ford Escape with index marks.***

On the subject crash Ford Escape, the middle of the logo impression was made on the trim piece below the rear window. The left column of **Figure 59** shows the center of the F-250 logo overlay located between 1.5 to 1.75 inches toward the right of the reference point on the subject crash vehicle.

On the crash test Ford Escape, the middle of the logo impression was slightly lower than the trim panel. The right column of **Figure 59** shows the center of the F-250 logo overlay located approximately 0.5 inches toward the right of the reference point.

Utilizing the analysis documented in these images it appears that the logo scuff on the crash test Ford Escape was approximately 1 inch to 1.25 inches farther left from the longitudinal centerline than was the logo scuff on the subject crash Ford Escape. A portion of this difference may be explained by the rear hatch displacement to the right as shown in the point clouds and photos.

*Vehicle Deformation*

In Mr. Buchner's June 14, 2024 report, he stated on page 2 and page 4 that the total crush on the test Escape was significantly less than the accident or subject Escape. Three-dimensional scans of both the subject Escape and test Escape were performed during the course of this project. The three-dimensional scans were combined and a heat map was created (**Figure 60**). The blue in the figure means there is a minimal amount, if any difference between the two vehicles. The light green color indicates there was approximately 3.5 inches or less difference. The red color indicates there was seven inches or more difference between the two vehicles. Three of the red locations were due to the subject vehicle being lifted and the tires and suspension were in a relaxed position. Three other locations were attributed to the rear bumper components and an interior trim panel. The other two red locations were on the roof and rear hatch. The difference of deformation in these positions were likely due to the difference in bumper height between the test and subject F-250. Overall, this heat map shows the deformation between the two vehicles was similar.

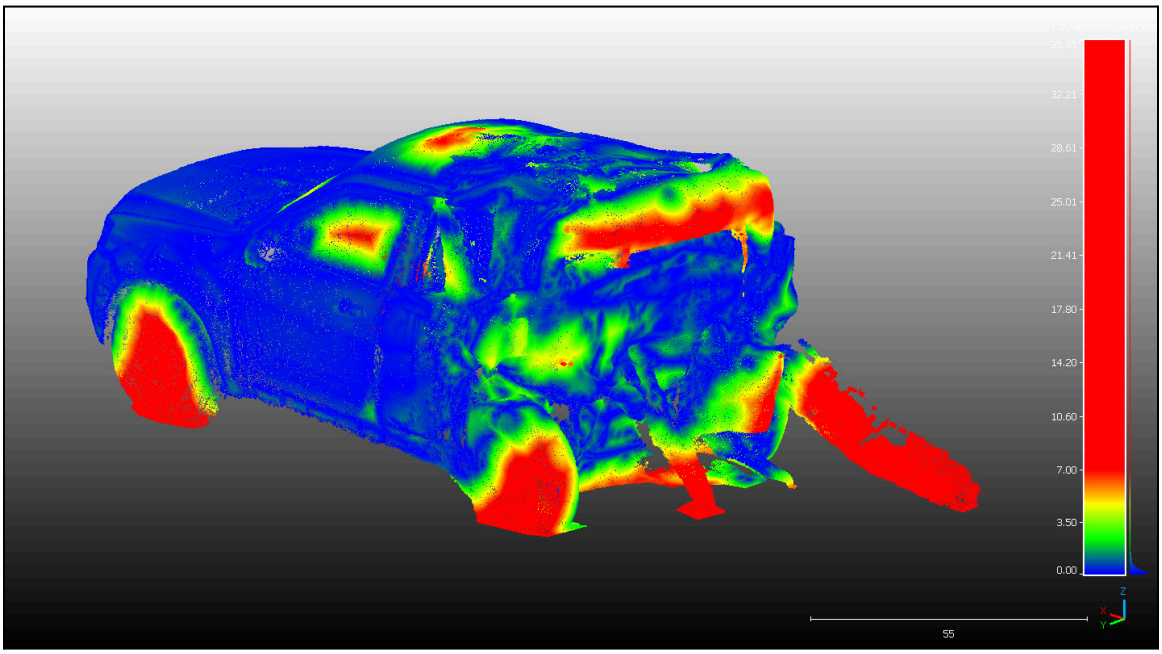



***Figure 60: Heat map showing deformation difference between the test and subject Escapes.***

Furthermore, on page 5 of the same report, Mr. Buchner showed a comparison of maximum engagement in his Figure 2. This is a misleading comparison. The figure was brought into a CAD program and scaled according to the targets on the right side of the F-250. First, in the screenshot of the crash test, there is a gap between the front of the Escape and the blue line. In addition, the right-front tire of the F-250 is displaced rearward (**Figure 61**). Even with the right-front tire displaced rearward, the wheelbase of the F-250 in the test picture is approximately five inches longer than the wheelbase of the scanned F-250 picture. Moving this tire back to its original position would increase the wheelbase discrepancy. In **Figure 61**, the distance between the rear blue line and the rear of the scanned (subject) vehicle is approximately 9.4 inches. Removing the five inches for the wheelbase difference and the gap at the front of the Escape reduces the difference in the deformation to approximately 4 inches.

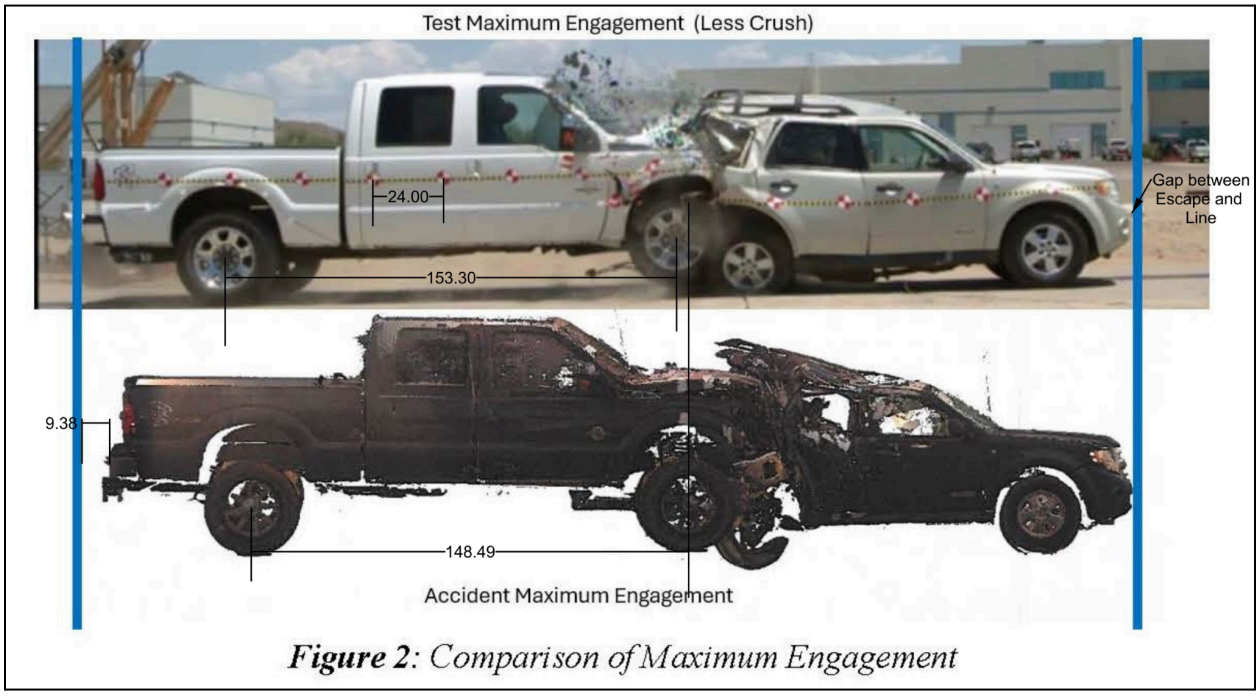



***Figure 61: Differences in Figure 2 from QE June 14, 2024 report***

*Rear Seat Deformation*

The interior of an exemplar Ford Escape was compared to the interior of the Ford Escape used in the crash test. The interiors were scanned and photographed. A measurement from a joint seam in the upper dash, just to the left of the instrument cluster, to the front edge of a black plastic trim panel just outboard of the left-rear headrest. This measurement was made in the exemplar vehicle and the test vehicle. **Figure 62** depicts this measurement in the exemplar Ford Escape. **Figure 63** depicts this measurement in the Ford Escape used in the crash test. This part of the rear seatback was displaced forward approximately 11.5 inches.

***Figure 62: Measurement to upper left of rear seatback in exemplar Ford Escape.***

***Figure 63: Measurement to upper left of rear seatback in test Ford Escape.***

A measurement was made from the daylight sensor, located in the top middle of the dash, to the middle top of the rear seatback. The reference point on the rear seatback was a black plastic trim around the right headrest post. **Figure 64** depicts this measurement in the exemplar vehicle and **Figure 65** depicts this measurement in the test Ford Escape. This part of the rear seatback was displaced forward approximately 10 inches.

***Figure 64: Measurement to upper middle of rear seatback in exemplar Ford Escape.***

***Figure 65: Measurement to upper middle of rear seatback in test Ford Escape.***

A measurement was made from the aft edge of the center console to the lower middle of the rear seatback. **Figure 66** depicts this measurement in the exemplar Ford Escape and **Figure 67** depicts this measurement in the test vehicle. This part of the rear seatback was displaced forward approximately 10.5 inches. Note that this measurement also includes more of a vertical component in the exemplar vehicle, thus the actual displacement would be slightly less.


***Figure 66:- Measurement to lower middle of rear seatback in exemplar Ford Escape.***

***Figure 67: Measurement to lower middle of rear seatback in test Ford Escape.***

**Figure 68 through Figure 70** depicts still images extracted from a 360 video of the seatback area of the test Ford Escape. It can be seen that the seatback is displaced and distorted. In addition, these images show that the interior of the vehicle hatch made contact with the aft portion of the rear seatback.

***Figure 68:- Still image depicting the vehicle rear hatch and rear seatback.***

***Figure 69: Still image depicting the vehicle interior and rear seatback.***

***Figure 70: Still image depicting the vehicle rear hatch and rear seatback.***

*Ballasting of the Test vehicles*

In non-governmental crash testing of vehicles, the ballasting of the vehicles is typically based on axle weights. During this testing, the vehicle fluids are removed due to environmental hazards. The batteries are also removed depending on their location and the location of the anticipated deformation. Anthropomorphic Test Devices (ATDs) or crash dummies are typically not utilized in crash testing unless injury criteria measurements are desired. After the fluids and other components are removed, the vehicles need to be ballasted to the approximate subject vehicle total weights and weight distributions, ensuring ballast is not in the impact area that would change the stiffness coefficients of the vehicles. The vehicles in the crash test were ballasted in such a manner. The axle weights of both vehicles in the crash test were representative of the axle weights of the subject vehicles.

## Conclusions

We have completed the analysis of this incident as documented herein and have developed the conclusions outlined to a reasonable degree of engineering certainty. This analysis is based on the items listed herein and if additional information becomes available we will need to review the information and determine how the analysis and these opinions are affected.

12. The SIMON (SImulation MOdel Non-linear) run in this case file by Mr. Buchner was apparently executed and saved utilizing HVE Version 17.00. Note that the current version of HVE is Version 18.02. The older version of HVE was installed to duplicate Mr. Buchner's work in this case.

13. As expected, the crush depths vary a little between the different impact configurations, but overall are very consistent, even though the impact configurations were significantly different.

14. These results show that the SIMON tool is not accurately modeling the crush on the Ford Escape in this case, at these speeds and impact configurations. Mr. Buchner's usage of the HVE/SIMON tool is invalid.

15. In the crash test setup, the lateral offset of the vehicles' longitudinal centerlines was approximately 10.9 inches. In comparing the overhead video of the crash test and photographs of the lineup of exemplar vehicles, it appeared the crash test impact location was near the exemplar lineup impact location..

16. Analysis of the F-250's front logo scuff on the rear of the Escape in the crash test indicates the centerline of the Ford was approximately 1 to 1.25 inches to the left of the logo scuff on the subject crash Ford Escape when the scuffs were made.

17. The location of the logo scuff on the test Escape was lower, relative to the hatch window, than the logo scuff on the subject crash Escape.

18. The F-250's front logo scuff on both Ford Escapes discussed are on complex 3-dimensional surfaces. These surfaces were distorted and displaced during the respective crashes and it is unknown exactly when the scuffs were made. In addition, some of the difference in logo scuff location might be explained by the rear hatch displacement to the right shown in scan files and photos.

19. From the scans of the subject Escape and the test Escape, the heat map shows the deformation to both Escapes was similar. The differences were mainly the tires and rear bumper components.

20. In Mr. Buchner's June 14, 2024 report, his comparison of the crash test and subject vehicles is misleading since the vehicles were not scaled appropriately.

21. The rear seat back was displaced forward in the test Escape. The top of the left-rear seat back was displaced forward approximately 11.5 inches and the top of the middle-rear seat back was displaced forward approximately 10inches.

22. The Ford Escape's rear hatch made contact with the rear seat back in the crash test.

23. The ballasting of the crash test vehicles was typical for this type of test. The vehicles were ballasted to the approximate calculated axle weights.

Respectfully submitted,

MECANICA SCIENTIFIC SERVICES CORP

Wesley D. Grimes, P. E.
Director of Forensic Services


Expires 03-31-2026